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1. Find an equation of the plane that passes through the points $(0,1,1)$, $(1,0,1)$, $(1,1,0)$.

$U = \vec{PQ} = \langle 1, -1, 0 \rangle \qquad V = \vec{PR} = \langle 1, 0, -1 \rangle$

$U \times V = \begin{bmatrix} \hat{i} & \hat{j} & \hat{k} \\ 1 & -1 & 0 \\ 1 & 0 & -1 \end{bmatrix} \qquad \hat{i}(1-0) - \hat{j}(-1-0) + \hat{k}(0+1)$

$\hat{i}(1) - \hat{j}(-1) + \hat{k}(1) = [1, -1, 1]$

$(1,1,2)$ Fav Point

$(x-1)\cdot 1 + (y-1)\cdot -1 + (z-2)\cdot 1$

$x - 1 + (-y) + 1 + z - 2$

$x - y + z - 2$

$\boxed{x - y + z = 2}$

2. Find the intersection of the line

$$\mathbf{r}(t) = \langle 1,1,0 \rangle + t\langle 0,2,4 \rangle$$

and the plane

$$x + y + z = 14 \quad .$$

$r(t) = \langle 1,1,0 \rangle + \langle 0, 2t, 4t \rangle$

$r(t) = \langle 1, 1+2t, 4t \rangle \qquad x+y+z = 14$

$x = 1 \qquad\qquad y = 1+2t \qquad z = 4t$

$y = 1 + 2(z/4)$

$y = 1 + \dfrac{2z}{4} \qquad\qquad 1+1+\dfrac{2z}{4} + z = 14$

$2 + \dfrac{2z}{4} + \dfrac{4z}{4} = 14 \qquad 2 + \dfrac{6z}{4} = 14 \qquad \dfrac{bt}{}$

$2 + \dfrac{3z}{2} = 14 \qquad 4 + 3z = 28$

$z = \dfrac{24}{3}$

$x = 1 \qquad y = \dfrac{14-1}{-24/3} \qquad z = \dfrac{24}{3}$